Seminário de Mecânica

Talk 1: ForSyDe-GPAC, a Continuous Time Model of Computation for Cyber-Physical Systems Design.

Talk 2: A statistical analysis of the final configurations of three interacting dipoles

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Abstract.

Talk 1: Cyber-physical system (CPS) design is a recent engineering branch that combines computers and physical systems. Despite its success to deliver systems for military, medical, automotive, aircraft and many other applications, CPS design is well-known to be a vibrant research area, teeming with challenges due to manifold interleaving concerns regarding functional and non-functional properties of systems. As a discipline, CPS tries to combine different design approaches from distinct mature areas with established, and often incompatible, abstractions, lacking a common agreement on how to describe and interpret the different notions of system behavior. Our main point of interest builds around models. A model is an abstract representation of a physical process and serves different purposes in science and engineering: while scientists employ it to build better understanding about the physical world, engineers often use it to describe desired artifacts from a design flow. It is models, thus, that enable us to understand, predict, and finally to formally specify (in whichever order) the complex behaviors resulted from the coalescence of the cyber and the physical worlds. In this lecture we will discuss the ForSyDe (Formal System Design) mathodology developed since 2003 in the Swedish Royal Institute of Technology (KTH) focusing on its Continuous Time model of Computation, the contributions of the author to the project and future perspectives.

Talk 2: The study of magnetic granular materials and their macroscopic properties is a key subject in the path to achieve a better understanding of how ferrofluid suspensions behave. In this context, aggregation of magnetic particles may not be desired, as it may lead to the destabilisation of such suspentions. In this work, we present a mechanical model based primarily on the soft-sphere model and on magnetic permanent-dipole interations. This study focuses on 3 particle systems and their evolution in time. The outcome of the system is defined essentialy by its steady-state magnetic potential energy. Different values of magnetic potential energy lead to different configurations with relative particle positions. A statistical analysis of our data suggest a strong correlation between the friction parameters of the system and its final configuration.